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OFFICIAL PROCEEDINGS
Meeting of January, 1919.

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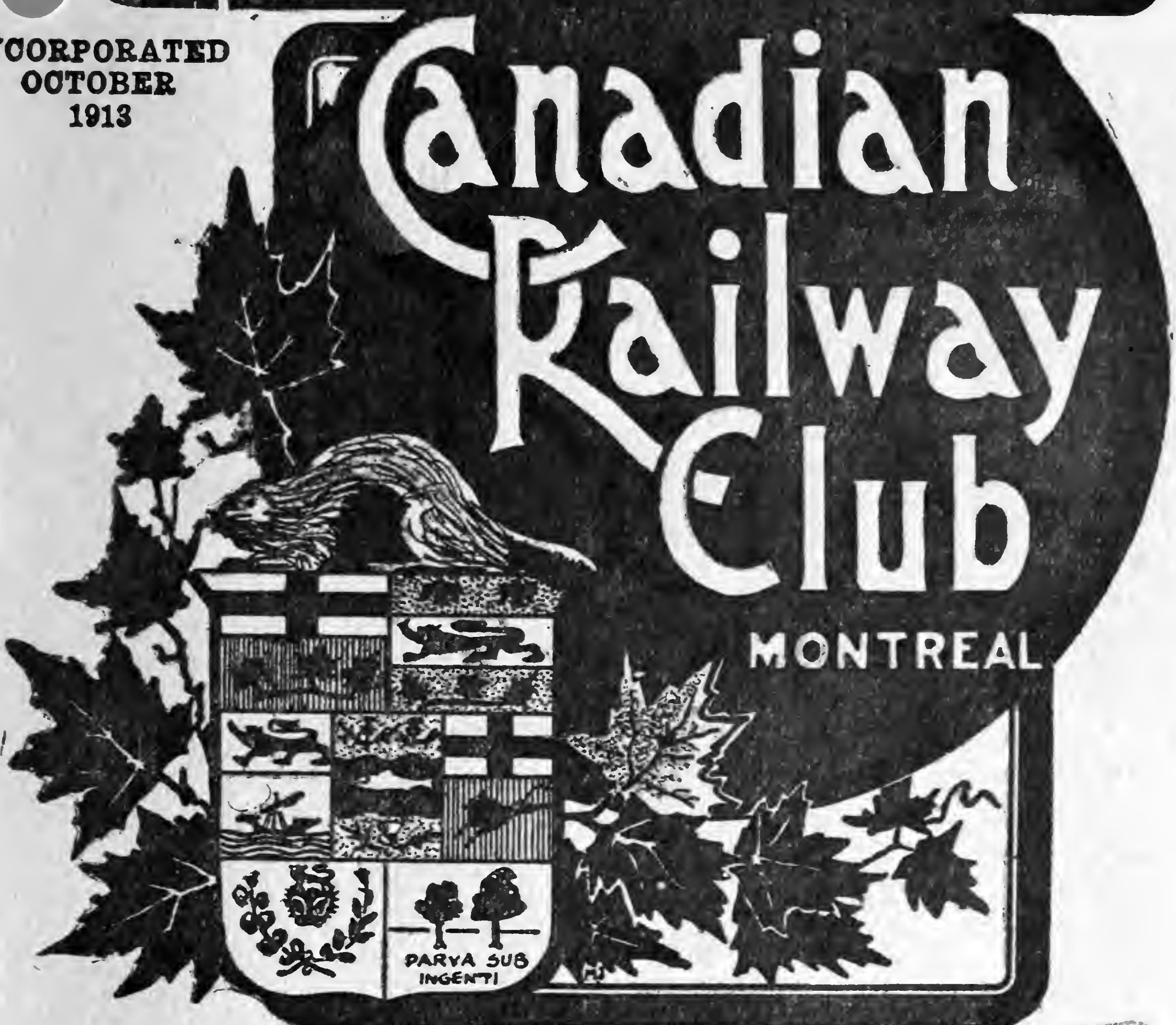

Contains:

REPORT OF JANUARY MEETING

ALSO

PAPER AND DISCUSSION ON "PRESERVATION OF RAILWAY TIES."

Canadian Railway Club

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Official Proceedings

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PROCEEDINGS OF THE CANADIAN RAILWAY CLUB.

Windsor Hotel,
Montreal, Jan. 14, 1919.

Mr. T. C. Hudson (President) in the chair.

MEMBERS PRESENT.

J. R. Ayers	John Hendry	A. Pope
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H. B. Downing	E. S. M. McNab	E. R. Viberg
H. J. Dyke	J. Millington	F. Whitcomb
S. deCudmore	G. B. McMullen	H. K. Wicksteed
T. W. Ellement	H. D. McMullen	J. Winterson
W. H. Estabrook	A. E.Mimms	A. B. Wright
W. G. Fielding	K. E. Munro	J. Powell
F. J. Gibson	H. R. Naylor	and others
R. M. Hannaford	J. E. Palmer	

Chairman:

Please come to order. The first order of business is the calling of the roll. Will the members please sign the cards which they will find in the seats? Next is the reading of the minutes of the previous meeting. The Secretary has issued these to the different members, and we will therefore consider them as read, unless there are any objections. I am not going to detain you as we have a very interesting paper. The Secretary will read the list of those who have applied for membership in the Club since the last meeting.

Secretary:

NEW MEMBERS.

H. Adams, President, Acme Vacuum Cleaner Company, New Birks Building, Montreal.

H. B. Broderick, Canadian Pacific Railway, Montreal.
T. H. Clark, President, Chambers Valve Co'y., 30 Church St., New York, U.S.A.
G. A. Cooper, Vice-President, Frost Railway Supply Coy., Detroit, Mich., U.S.A.
M. A. Doak, Manager, Eastern Car Company, Ltd., New Glasgow, N.S.
T. R. Duffie, Sales Dept., Holden Co., Ltd., 354 St. James St., Montreal.
H. J. Elliott, K.C., 189 St. James St., Montreal.
Leon Gagnon, Canadian National Railways, Edmundston, N.B.
C. Nelson Gray, Sales Dept., Holden Co., Ltd., 354 St. James St., Montreal.
Grant Hall, Vice-President, Canadian Pacific Railway, Montreal.
E. Hodsgskin, Transportation Vice-President's Office, Canadian Pacific Railway, Montreal.
W. Kennedy, General Mechanical Inspector, Grand Trunk Rly., Montreal.
A. T. Landry, Supervisor, Canadian National Railways, Bonaventure Station, Montreal.
Ferdinand Morin, Asst. Foreman, Angus Car Shops, Montreal.
C. Murphy, Signal Inspector, Canadian National Railways, 180 Valois St., Montreal.
G. B. McMullen, Engineer, Picton, Ont.
H. D. McMullen, 706 Bank of Ottawa Building, Montreal.
R. McLean, Engineer, 128 Bleury St., Montreal.
Hector McNeil, Instrument Man, Canadian National Railways, 417 Mackay St., Montreal.
R. J. Needham, Mechanical and Electrical Engnr., G. T. Railway, Montreal.
Horace Park, President, Bradford Draft Gear Co., 30 Church St., New York.
W .A. Pitt, Jnr. Asst. Machine Shop Foreman, Grand Trunk Rly., Montreal.
C. O. Poor, President, General Railway Signal Coy. of Canada, Lachine, P.Q.
J. R. Richardson, Engineer, Canadian National Rlys., Edmundston, N.B.
G. R. Soltau, Machinery Expert, Grand Trunk Railway, Montreal.
E. C. Thomson, Sales Mgr., Forsyth Bros. Co., Harvey, Ill., U.S.A.
F. A. Winterson, Assr. Supt., Canadian Pacific Rly., Place Viger Station, Montreal.

T. Stansfield Worthington, Managing Director, Beaver Engineering Co., Ltd., 149 Moreau St., Montreal.

Chairman:

You have heard the applications read by the Secretary, which have already been passed upon by the Executive Committee. What is your pleasure?

Mr. Hannaford:

I move they be adopted.

Mr. Hendry:

Seconded.

Chairman:

Moved by Mr. Hannaford, seconded by Mr. Hendry, that these applications be accepted. All in favor please signify in the usual way.

Carried.

Chairman:

As to reports of special committees the Dinner Committee have prepared a report.

Secretary:

I might say, Mr. President, that there have been two meetings of the Dinner Committee, and the matter is progressing favorably. I only hope that the members will come forward and get their tickets early and not all come on the night of the dinner, as we are somewhat rushed at that time.

Chairman:

That is a very good suggestion from the Secretary, as he is a very busy man on that night attending to various matters, and I would ask the members to carry out his wishes as far as possible.

Chairman:

Is there any discussion on the paper read at our previous meeting? If not, we will proceed with the paper for to-night, which is by Mr. H. K. Wicksteed, on "The Preservation of Ties." I will ask Mr. Wicksteed to come forward and read his paper.

"PRESERVATION OF RAILWAY TIES."

By H. K. Wicksteed, C. N. Rly., Toronto.

The question of a future tie supply for the railway has, for a decade or more, been a serious one in the United States, owing to the rapid depletion of the forests, and within the past five years the anxiety has spread to Canada.

Nearly five years ago the writer became, in the course of other business, acquainted with Mr. Geo. W. McMullen, of Picton, Ont., a man who has made the conservation of waste a life study and who had made wonderfully successful studies in other fields. The conversation turned on one occasion to the subject of the preservation of timber, and in the course of it some facts and theories of extraordinary interest were developed. Mr. McMullen had, in the course of other investigations, become possessed of a fairly complete laboratory and was in close touch with modern bacteriology and practical chemistry. As a result of the acquaintance, experiments of great interest have been made, involving an entirely new process of drying timber, and more especially with reference to railway ties, the supply of which has become, within the last few years, a most momentous question with the railways. More particularly has this become so in Canada, owing to the depletion of the forests and the great increase in railway mileage during the past half decade.

Average Life of Railway Ties.

Assuming the average life of ties, for instance, at six years, the Canadian Northern Railway alone will need over four million per annum and the other two trunk roads something more than this, or say from twelve million to fifteen million in all. Our northern forests cannot stand this drain for any length of time, much less can we hope by any reasonable efforts in reforestation to keep abreast of the demand. The timbers used are slow-growing ones, with the exception of jack pine, and even this takes thirty or forty years to attain sufficient size.

There are two means by which we can stave off the impending famine, one by increasing the life of the timber tie and the other by using some other material, such as steel or concrete. Such experiments as have been made in the latter expedient

have not been altogether satisfactory from the point of view of economy, even where they were so physically.

The first expedient is the only one which has come into any considerable use on this continent and it has usually taken the form of injection of creosote into the pores of the wood. This acts as an antiseptic, preventing the bacterial growth which results in decay through what we are accustomed to call "rot." The creosoting process, while a great advance on the use of raw woods, is by no means a perfect cure; first, because it is expensive, nearly doubling the cost of the tie; second, the timber is somewhat weakened in the process, owing principally to the high temperatures to which the wood is subjected; third, to be at all effective the timber should be thoroughly seasoned or dried, and this is hardly practicable by existing means except by the consumption of a large amount of time and space and the locking up of a considerable amount of capital for that time. The Germans stack and air-dry their ties for eighteen months or more before treatment, and even then do not get a dry tie or perfect product, and in America it seems to be seldom that more than one-third to one-half of this time is allowed.

Dry Woods Almost Indestructible.

According to notable chemists, dry woods or cellulose are almost indestructible by any ordinary agency such as the tie is exposed to. The bacterial growth requires moisture and oxygen for its development. It would appear, therefore, that if we thoroughly dry a piece of timber, and keep it dry, it will last indefinitely. We know from actual experience that this is so. Everyone has used or seen old timber in the form of beams and joists taken from buildings two or three centuries old and perfectly sound. In these cases moisture has been excluded. Again, every one has seen or at any rate read of piles and foundation timbers many centuries old in a perfect state of preservation. In these cases oxygen has been excluded. We all know that exposed timber will generally last longer when coated with paint or tar or some waterproofing material. The exceptions are where the timber has been waterproofed before it was seasoned, with the effect of retaining the moisture already in the stick and preventing its evaporation. Timber, even when air-dried for a considerable length of time, still contains fifteen per cent or more of moisture, the percentage varying with the nature of the material and the size of the stick.

SEASONING TIMBER INCREASES STRENGTH.

Another point not so well recognized or understood is that seasoning timber increases its strength by as much as 80 to 100 per cent in some cases, over that of the green stick. It will be seen at once that, consistently with reasonable expense and loss of time, it is well worth while to dry not only ties, but timber of any kind used as a beam or strut, where strength is necessary. If we increase the strength by even 60 per cent, we require only 62 per cent of the amount of material, and, as this percentage is dry, while the other contains a very large amount of moisture, the saving in freight is very much more than the apparent 38 per cent. In Eastern Canada, at any rate, transportation is a very large item in the cost of our timber and is compelling us, as a matter of expediency, to use steel and concrete where we should use timber if it were readily available.

It being granted that drying or seasoning is extremely desirable, the question is as to the means. In the case of ordinary lumber, air-drying supplemented by a few hours in a kiln is fairly satisfactory. In that of dimension timber it is not so. First, because the air-drying in the case of large sticks takes years to accomplish, because the temperatures used in the ordinary kiln are so high as to injure the strength of the timber; third, because, even when carried on with the greatest care and deliberation, the outside laminae dry first and shrink before the heart of the stick has any chance, and this shrinkage causes checks and cracks which, for many purposes, render the stick useless.

When the "wooden walls of England" were a reality, the seasoning of large sticks was carried on by immersion in sea water for a period of three years, more or less, the saps and resins were dissolved and washed out, and the pores of the wood left open and filled only by water. The subsequent drying was then easily, quickly, and uniformly carried on throughout the stick, and the resultant deposits of salt acted as antiseptics just as the creosote does in the modern process. This was perhaps the most perfect seasoning possible, or ever accomplished. The process was very likely suggested to the English ship-builder by his observation of the condition of logs and driftwood which, after years of immersion, had been cast upon his shores by the Gulf Stream and local winds and currents. The Eskimo knows no other process than this and his woods are very perfect and lasting; but, in these days of rush and hurry, it cannot be expected that anyone will pre-

pare his material three or four years in advance. Probably the excellent reputation which Canadian white pine had with the British Admiralty was largely due to its long immersion in the waters of the Ottawa and the St. Lawrence before it was finally loaded on shipboard.

Wash Out Sap and Other Liquids.

In the experiments made in the last two years, as above mentioned, an effort was made to use the same process that nature does, and dissolve, neutralize or wash out the sap and other liquids or semi-liquids which obstruct and close the pores, and to do this within a reasonable time, much faster than nature unassisted can accomplish the work. Hot water is more effective than cold water, and hot vapour of water is, in some cases, still more so. In the new process, which is simplicity itself in theory, although the best form of mechanical application took much time and thought to study out, warm vapour, or in other words, warm air, saturated with moisture, is circulated among the ties. This opens and cleans the pores of the wood just as a Turkish bath does in the case of a man. The liquid components of the saps and resins filling the vesicles themselves, expand with the heat and force their way out, to be diluted and carried away by the warm vapour. After some hours of this treatment, the amount of moisture is reduced by very slow degrees, until, at the end, it is practically dry and the timber is removed with not more than 5 per cent of moisture left in it. The rapidity with which this is done depends upon the size of the sticks and the nature of the timber, just as it does in other methods, but no subject has yet been found which did not, in the end, yield to treatment. Care is taken not to let the temperature of the kiln get above 160° F. so that no injury may be done to the fibre of the wood.

Coating to Exclude Moisture.

Timber so treated is, I believe, indestructible, except by fire, so long as it is kept dry. Even without further treatment, it will undoubtedly long outlast unseasoned material. It is, in this shape, in pre-eminently good condition to receive creosote, but we believe that creosote is absolutely unnecessary and that the elements of decay being altogether removed from the inside, all that is necessary is to keep them from entering from the outside. Some waterproofing coating is desirable,

and in the case of ties a cheap one is the only one which can be economically used. In the experiments so far conducted a heavy oil tar was found, which answered the purpose perfectly, and which is an almost worthless by-product of the refineries. The ties are merely dipped in a hot bath of this material for a few minutes and, on coming out, are sanded by a sand blast to absorb any superfluous stickiness and make them easier to handle, just in the same way as an asphalt road is sanded. Timber for building, where neat joints and carpentry are required, would probably be better treated with some pigment mixed with oil or varnish, but for rough work the asphalt or mineral tar seem to be all-sufficient and very inexpensive. The estimated cost of the drying process is seven to eight cents; of the protective coating three or four cents a tie. Taking the higher figures and adding a margin, it would appear that fifteen cents will cover the total cost.

Increases Supply of Tie Timber.

The prospect which is opened up by this process is something more than merely getting the equivalent of the process-creosoted tie at a less cost. It is, besides, the potentiality of using for ties, timbers which are now useless for the purpose, or nearly so. The northern birch, for instance, is a strong reliable wood, used by the Indians for every purpose requiring a hard wood, but unavailable for ties or bridge timber on account of its superabundant sap and its consequent tendency to rot rapidly. The poplar and the balsam are others for which there is at present practically no demand. These timbers are particularly interesting to us just now on account of the recent opening up by the railways of thousands of square miles of northern forests, of which, with spruce and jack pine, these are the main constituents. The use of these woods for commercial purposes means not only millions of dollars to the railways in reduced cost of ties and in freight, but more millions to the people of Canada who have been burning up and wasting this forest growth as something not only worthless, but as actually impeding settlement.

Conserve the Northern Forests.

It is quite conceivable—I think we may say probable—that the settler in New Ontario or Northern Saskatchewan or Alberta, will find it profitable to conserve the forest on a considerable portion of his land, cutting from year to year

only the mature timber so as to encourage the young growth. Aside from the question of ties and pulp wood, what a large potential value there is in poplar, balsam and spruce! In Winnipeg's early days, poplar lumber was the principal material in house building and there was no fault to be found with it, except its shrinkage, which dhying would have prevented.

Balsam is to this day the principal cut of the little country mills in northern Nova Scotia for home use, and is an excellent material for inside carpentry. Spruce is the finest material for spars, probably, of any known; and only its perishability prevents it from making a cleaner, straighter, and stronger telegraph pole than the crooked twisted cedars we are using. Birch is already coming to its own in the manufacture of furniture. Our northern settler has been in the habit of burning up most of these timbers as almost worthless, in order to grow potatoes in their stead. A century ago the settlers in Southwestern Ontario thought much the same about the white pine and the black walnut, and some of the wealthiest residents in that portion of the country to-day are those whose fathers either by accident or design left some of the original forest standing.

So much of this paper was written two years ago, and there is practically no change in it except in respect to one or two details as a result of more testing which has been carried on, and as to the figures of costs which would be considerably higher than those quoted.

A number of ties have been put in the Canadian Northern track, and while the times have been somewhat too strenuous of late for experimenting, and changes in staff have led to the neglect of the examination of these from time to time, some of them have been taken up and tested for absorption of moisture and for signs of rot.

I have here one sample of a tie dug up only a few days ago which had been under the track in the Trenton yard for over three years; and I have also another sample of a birch tie which has never been under the track at all but which shows how absolutely perfect the drying part of the process is and what avaluable timber birch is. I think all of you probably know what an absolute worthless timber it is if used in outside work without seasoning, and the reason is unquestionably the amount of sap which it contains. If this is dried out and

the wood sterilized, it is as strong and lasting as most other hardwoods and better than some. It is incidentally the only hardwood in Northern Ontario and Quebec.

As a result of our experiments with these ties we concluded that they were in the right direction in the main, but that the asphaltic waterproofings were imperfect. They melted and ran under a strong hot sun; and when abraded, as was inevitable in the case of ties, the waterproofing was gone. Some of the more tarry products which penetrated the grain of the wood were much better, and we believe them to be very good indeed.

Except for the expense, creosoting after the seasoning process has been carried out would be perfect; but I for one am extremely doubtful of the efficacy of creosoting for an unseasoned stick of timber. It always seems to me like putting a coat of paint or varnish on green wood. This merely closes up the outside pores of the wood and prevents the evaporation and oxidation of the juices and saps of the interior.

I have already alluded to the care which the Germans take with their drying and seasoning, but we are too impatient in this country to wait for this and we give at most eight or nine months, which is not enough. All of us probably have seen standing timber after a bush fire. For a year or so the seasoning goes on all right, and then the borers get to work. They bore through the hard seasoned outside shell so as to get at the juices of the interior; which shows that the juices are there although the stick has been seasoned under almost ideal conditions standing straight on end, and nearly always with the bark on to shed rain and snow.

Creosoting, I understand, costs now some 40 cents per tie; so that the treated tie costs us considerably over $1.00 and is heavier and harder to handle than the untreated tie. One of the advantages claimed for the seasoning is that it very greatly reduces the weight instead of increasing it, and that as a result we have less to pay for transportation and for trackwork.

The seasoning can be accomplished in a month or less (the time varies with the character of the timber) so that even if we resort of creosoting we save time and interest on money invested in green ties, and we save room in our piling yard and drying sheds.

I have dealt in the above practically altogether with ties, because it is one problem which is bothering us railway men

a great deal. Even before the war and the recent enormous advance in prices, we had become so impressed with the growing scarcity and increasing cost of timber ties that we had been making all kinds of experiments with metal and concrete ties—not in order to cheapen the first cost, but to lengthen the life of the tie and so make its annual cost less.

If we go into concrete at all, it has always seemed to me that we should alter our whole system of support to a longitudinal instead of a transverse bearing, and this again would alter the most economical form of rail to be used. Possibly we might, with a long stringer of concrete giving us the necessary stiffness and rigidity, dispense with enough steel to pay for part of the increased price to the bearing; but imagine what we should get in the way of drainage and precautions against frost heaving in our climate! I have seen reinforced concrete ties doing very excellent work in the tropics, but our frost conditions alter the whole aspect of the matter. Shimming upon the top of a concrete tie would be a very different matter from drawing the spikes out of a wooden tie and putting longer ones in; or, as we have to do sometimes, putting a complete new tie on top of the old one.

I am afraid that for many years to come we must continue to use wooden ties, at any rate on all but the most perfect and most heavily congested parts of our railways; and this being the case, and the supply diminishing while the demand increases, it behooves us to make them as long-lived as possible.

There are, besides the item of ties, a great many other utilities about a railway which we have hitherto been accustomed to build of wood, but for which latterly we have been substituting structures of steel, concrete and other materials; and the reasons for the substitution have been the same—increased life and lower maintenance charges, and also, in the case of timber trestles, water tanks and buildings, danger from fire.

On our own Canadian Northern at any rate we have had numerous cases of bridge decks catching fire, and in many cases the fires have spread from the decks to the body of the structure; but in how many cases have we found that the commencement of the fire was where some little punkiness and rot had started, and that a smouldering fire had been fanned by a strong wind into a blaze!

Ballast decks have been introduced to obviate these fires, but they don't seem to have come into general use; and the tie, aside from fire risk, certainly does not last so long as if freely ventilated. Prevent the rot and I think you will find

that the risk of fire is greatly diminished. Season the timber thoroughly and apply a fireproofing coating of tar and sand similar to what we have put on our building roofs at times, and the risk will disappear almost entirely.

In this case, the question of abrasion, of the rubbing off of the protective coating, does not come in at all; but the protective coating, whatever it may be, should not be put on unseasoned timber.

We all know of old bridges and other structures which have been protected from the weather and have stood up for a generation or more, and been replaced only because too small or too weak for modern loads; and in many cases where wooden bridges have been replaced by steel and concrete, it is somewhat questionable whether the change was economical in the fullest sense of the word, and whether it would not have been better policy, as an intermediate step, to take more care in preserving the timber and to put concrete abutments and piers under it.

One of the main reasons for much of the substitution of steel for timber in the recent past has been the growing scarcity of the latter and the cheapness of the former; but still more recently the conditions have been reversed and steel has become very difficult to obtain while timber has not increased in price in the same ratio. These, of course, are largely temporary conditions brought about by the exigencies of war, but they are not going to readjust themselves in a few months.

Practically all of our dimension timber has come of late years from British Columbia or the Southern States, and the cost to us here is largely a matter of freight rates. Freight rates are based on weight. If we can remove the thirty or forty per cent of moisture which many of our timbers contain and at the same time increase its strength by proper treatment before it starts on its journey, it follows that smaller quantities will often answer our purpose and that these quantities will be lighter in weight and cost us less per cubic foot, so that there is a double gain, and I believe that in the aggregate it is a very important gain indeed.

There are many advantages in the use of timber structures in certain situations; and if we could increase their life and lessen the risks from fire, I think we should all feel much less inclined to rush into massive structures of steel and concrete.

Permanent work which will last through the centuries is all very well in its proper place in connection with great undertakings which will themselves be useful for centuries.

Railways, in this country at any rate, are not always of this character, and I have known several cases (I have at this moment in mind some very expensive and well constructed works) which have been a stumbling block and deterrent to improvement, because they were built in the wrong place and the authorities did not want to throw them away. How many of our railways are located in the wrong place to suit modern conditions of traffic, not so much because of blunders or short-sightedness on the part of the original builders, but because the financial and economic conditions of the present day are entirely different from those of a generation ago—and who can say to what extent these conditions may be changed another generation hence!

Take the case of the Canadian Pacific across the western plains, for instance. It has been relocated and rebuilt for miles; but who shall say that the original location and construction were wrong? Is not the financial success of the C. P. R. direct evidence to the contrary, and that the light grading and cheap timber trestles and bridges were absolutely right and good policy?

Take the opposite case of the Grand Trunk, built two generations ago to the high constructive standards of the English roads. Not only was the road handicapped from the start by enormously high capitalization, but it was deterred from making desirable changes in location by the existence of such expensive works. I have myself been told that a certain location was unocceptable because it would "scrap" a $50,000 structure. The Canadian Pacific is to-day built on that identical location and is hauling nearly double the Grand Trunk loads.

Consider the now developing railway situation in Canada. Two transcontinental roads have been built across the continent, with the avowed intention of competing in a great many cases with one another. The change in economic and sociological conditions has brought it about that these two lines have come under the same ownership and management. One of these has cost about double what the other has. Without asking the question whether one might have been dispensed with altogether, it is safe to say that the money which has gone into expensive construction could be put to very much better use to-day if it were available.

Because we have just made a great effort and surprised ourselves by borrowing nearly a billion dollars from our own people there is no reason why we should rush into indiscriminate expenditures. There is an enormous amount of work to

be done to bring our railways to the highest standard of efficiency, and it behooves us to be sure that our money is spent judiciously. There will be none too much to go round, and anything in the way of economy which can be effected consistent of course with due respect for the safety of the public —(don't let us confuse economy with parsimony)—will be well worth doing.

I have come here to-night with the preliminary confession that I had nothing to teach anybody and am quite incompetent to do so.

The development of railways has gone on so fast that I have become somewhat taxed in changing old ideas and convictions for new ones fast enough to keep up with the times; but I have thought much about the fundamental reasons for things and have watched with much concern a growing tendency towards extravagance and luxury among railways as well as individuals.

If a timber structure will answer its purpose as well as a steel one and save money for a much needed improvement elsewhere, by all means let us use the timber.

If ties can be treated with or without creosote so that they will last so much longer than untreated ones, so that the *annual* charge against the railways will be less even though the initial expense is greater, by all means let us investigate the treatment.

What I undertook to do was to give you for discussion a subject worth discussing.

My friend, Mr. McMullen, died while he was pursuing his investigations—literally so, for he passed away on a train out of Chicago where he had been attending a convention of the American Railway Engineering Association. His son, Mr. Barrett McMullen, has carried on his work, and I have asked him to come here to-night to answer any questions you may wish to ask as to the details of the process; and I beg now to introduce him to you.

Whether the final outcome will be that the seasoning will be merely a preliminary to creosoting, or whether other and cheaper preservatives may be found, I cannot say. I am firmly convinced of one thing only and that is that the proper seasoning of timber preliminary to treatment or use has never received proper attention; that Mr. McMullen's process accomplishes it perfectly; and that if it is used freely, the use of

timber for ties or otherwise will be much more justifiable and truly economical than it has been in the recent past.

Mr. Wicksteed:

Mr. President, I would like to introduce Mr. McMullen to the meeting. He has carried on the experiments, and is much more familiar with the chemistry and bacteriology of the question than I am. I am only conversant with the economic side of the subject, just as any other railroad man.

Chairman:

I am sure we all feel that Mr. Wicksteed has given us a very instructive paper, and we will be pleased to hear from Mr. McMullen later on in answer to any questions which the engineering men may desire to ask. Mr. Crumpton, may we hear from you?

Mr. Crumpton:

Mr. President and fellow members, what strikes me most about this subject is that, from an economic standpoint, the preservation of timber offers an alternative having advantages over the present practice of passing directly from the timber to the concrete and steel stage.

I have in mind a bridge which it was estimated would cost $150,000 to renew in permanent materials. Renewal in timber would cost about $20,000. If by the treatment outlined the life of the timber bridge could be lengthened appreciably its cost per annum would be less than that of the bridge built of untreated timber.

Mr. McMullen:

We are unable to give accurate figures on the cost but estimate it about 30 cents. It may be that this could be brought down, but the cost of the plant would be much higher now than before the war. One of the principal items of cost is for fuel for drying and we all know the price of coal at present. I have brought some figures of the tests made at Trenton to show the weight of the ties and the amount of moisture that has been absorbed. The whole problem was whether or not we could successfully waterproof the tie and keep it dry. We tried asphalt, also coal tar pitch. We found that the asphalt was useless in many cases. Some poplar ties treated with it are rotten now, but poplar ties that had pitch applied are all right. The pitch has a penetrating quality which the asphalt does not possess. The ties now under test have been over

three years in service. After eight months ties examined had increased in weight about 2½%. The next tie, taken out after fourteen months, had been treated with asphalt. It had increased 13%, while two pitch-treated ties taken out at the same time had increased 1½% and 7%. This last was a spruce tie. When in for two years two pitch-treated ties had increased 7½% and 2.9%, while a couple of asphalt-treated ties had increased 14% and 16%, showing the difference in the two treatments.

In November, 1917, one pitch-treated tie had gone up 7% and another 17%, but in this last case there had been a strip of bark left on one side of the tie, which allowed it to become exposed. In May, 1918, one had increased 12%, one 5% and one 10½%. The sample which Mr. Wicksteed has here to-night was taken up in November last. It had increased 6.9%. These last four ties were all pitch-treated. In our kiln dried ties the moisture is down to 5 to 8%, so that apparently we have, up to the present, kept most of the ties down below 15% moisture, which we figure is required to even start bacterial action.

Mr. Wicksteed:

Mention is made in the paper of some samples, but I forgot to show them. (Mr. Wicksteed exhibited samples.)

Chairman:

If any of the members interested would like to come forward and examine these samples we shall be glad to have them do so.

Mr. Wicksteed:

This is a tie (exhibiting sample) which has been under the track for three years. It is a hemlock tie. This other piece (exhibiting sample) was never down in the track. It is birch and shows what a perfect timber birch is when it is dried through and through.

I might say that these ties were laid on a curve and had no plates. We found the most moisture under the rail, due to rail cutting, but we also found that some new, untreated hemlock ties placed among our ties one and two years ago were rail cut much more.

Chairman:

How do the spikes hold?

Mr. McMullen:

The first spikes pulled out after 8 months were perfectly dry showing that they had not moved, but after that there was a little moisture. Our first proposal was to bore holes in the ties, fill the holes with pitch and drive the spike, but we were told this could not be done as the sectionmen could not be depended upon to attend to it, so the usual practice was followed.

Mr. Norman Holland:

I have an interesting sample of a tie which I forgot to bring with me to-night. It is a piece of tie from the original road laid across the Isthmus of Panama. It was laid in 1872 and has the spike in it. The Panama Exposition Committee cut up about twelve of these ties and samples were sent to favorded individuals. I got one of them. The spike is in perfect condition and the wood is perfect, after all these years, but unfortunately the ties could not be used up here. They are made of Lignum Vitae.

A Member:

I would like to ask Mr. McMullen if he can tell us anything about the result of some experiments in creosote treatment of ties as carried on in the plant at Montana?

Mr. McMullen:

I do not know anything about that plant. There are several good plants for creosoting but I do not know that particular one.

Mr. Cunningham:

I was very much interested in the paper read to-night on tie and timber conservation—it has all the characteristics of having been prepared by a practical man, one who knows his subject. There is no bigger subject in railway practice, indeed, in the whole country to-day, than the conservation of timber. It is a national subject. For one to take a trip through mountains in the west and to observe the amount of waste it would be vaguely understood how vitally important the subject of timber conservation is. To visit the States of Wisconsin and Michigan and to learn a little of the depletion of timber areas would help one to understand. About 15 years ago I was interested in increasing the life of ties for the reason that early railroading with scant ballast exposed ties to brief existence in alkali soil. There was a plant at Somers, Mont.,

where they treated fir, tamarac and jackpine and the softer species such as hemlock and spruce; in fact, all timber species as they came to them in the bush. The tie question was receiving the closest attention of President Hill, of the Great Northern Railway, who thought he would extend the source of supply by increasing the number of species of timber usually used, and he had a plant put in at Somers, Mont., where they cut ties from trees of all descriptions. Ties were run on small steel cars into long cylinders which were hermetically sealed. Ties were then soaked in saturated steam, followed by hot water for three or four hours to soften the gums. This was pumped out and a vacuum created and held for a fixed period, and then a creosote liquid was pumped into the cylinders under pressure and kept thus for a specified time, until the desired penetration was accomplished. These ties were now supposed to be in a condition to render at least a double span of life in service. Fir, tamarac, spruce, in fact, any kind of suitable sized tree which they came to in the bush was cut down and put through this process. I have not had an opportunity to fully note the success of this treatment. The process was not a cheap one and could not be undertaken on any but on an extensive scale.

With respect to the question of drying car lumber dimension and sheeting it might be of interest to state that, while railway companies buy their lumber in the west at a price f.o.b. sawmill, the sawmill people sell to the commercial trade at prices f.o.b delivery point. This difference is most significant as indicating that it might be well to buy on the commercial basis and ship the lighter weights. It is likely that the railways could find something of advantage to themselves by studying the commercial practice.

With regard to the timber referred to in the paper as growing in the northern forests of Saskatchewan and Alberta, this is principally spruce and is not used for tie purposes. It is very light, of open fibre, and its life would be short from mechanical wear as well as from other causes. Fir and tamarac and jackpine ties and some oak, where they can be had, are used and a certain percentage are creosoted. There is difficulty in getting sufficient to carry on with. The preservation of ties, in an economic way, has been constantly studied, and the study is still proceeding.

I appreciate very much the excellent paper which has been submitted and feel grateful to the authors.

Mr. McMullen:

In connection with this creosoting process, I might say I understand that at Trenton, while they can creosote green timber they find it is not economy to do so, as they have to boil out the moisture during the creosoting process, and the presence of this moisture in the creosote causes a great deal of trouble afterwards. They therefore air dry the ties as much as required to put in the creosote. They do put it into the centre but as a rule it is in streaks in the centre of the ties.

Chairman:

Can you tell us the capacity of your plant, Mr. McMullen?

Mr. McMullen:

We have only an experimental plant which can handle one car of ties at a time. We have never made a business of it. We have dried four carloads and these ties are now on the Canadian Northern and on the Government Railway near Moncton, N.B., under test. We now consider that the tests show enough advantage in our method to justify the cost of treatment. We believe that these treated ties are better after three years' service than new untreated ties.

Mr. Crumpton:

I would like to ask Mr. McMullen what is the cost of creosoting as compared with his method.

Mr. McMullen:

I have not looked this up recently, but I understand that Mr. Wicksteed did so and he puts it in his paper at 40 cents. In addition to this the railway companies place the ties at the treating plant and leave them there for about seven months. With our process the cost would be about 30 cents and the ties would be left at the plant for a month or six weeks instead of seven months.

Mr. Hannaford:

In regard to the preserving of timber, I think there can be no doubt but that it is a very vital issue at the present time. The road I belong to uses a small proportion of ties (about 30.000 per year) as compared with the steam roads, which use from one to two million, and this makes us look like "pikers" in the game, but even so the question is important to us as it is to them. The street railways have tried various means of saving their ties, and as it is the practice to use concrete over

them, and there is difficulty in getting at them when repairs require to be made we generally allow them to go until the track requires to be taken up. The rails are laid in concrete with concrete around them to hold up the paving. There is a tie which has been tried out in the States, which is made of concrete, reinforced, and having a small pocket into which a wooden plug is inserted after being treated with preservative, the object being to give greater resiliency to the rail, so that we appear to be going into a combination of wood and concrete. There was a tie made where a man wanted to use up old rails and he twisted the rails into a loop, at each side of which was a piece of tie about two feet long. He was trying to get economy in this matter of ties. I think the preserving process is certainly an excellent thing, providing it does not cost too much, but there again the big railway companies are at a disadvantage, as they either have to buy the ties from the people treating the ties or ship them to the treating plant, and there is the cost of freight rates to the plant, the cost of creosoting and the cost of the freight rates when the ties are returned, so that it makes this creosoting process very expensive. We used to wonder how expensive a tie had to be before we should use creosote—for instance, when ties were selling in small quantities at 40 cents I asked the question of one man as to what it would cost if the tie was creosoted, and he said 90 cents. I do not know whether his opinion could be taken as reliable, but when you take into consideration the cost of creosoting and the various charges in connection with it, I think you will find that it will about double the cost of the tie, and it seems to me that the concrete tie with the wood insert would be cheaper. This is a very vital subject and should be well discussed.

Mr. Holland:

The concrete tie with the wood insert is being used on the Pennsylvania and New York Central Railroads. It is also being used in some of the New York subways. They are creosoting the wooden plug in some instances.

A Member:

I would like to know from Mr. McMullen if his process softens the tie to any extent.

Mr. McMullen:

In a test made of a treated tie which had been in service for three years as against an untreated tie of the same wood

that had been in for two years, it was found that the untreated tie was rail cut the most. Also, laboratory tests made on the treated timber showed that the drying increased its strength in all directions, in some cases as much as 200%. Some experiments were also made in connection with McGill University, they sending a representative to our plant and we giving him some of our samples to test out. They found that the dry ing process increased the strength of the timber unless too high temperatures were used.

Mr. H. T. Dyke:

I notice that the average life of a tie is stated as being six years. I take it that this is for the untreated ties as commonly used in this country. If I remember rightly, in England the average life of a tie is from 12 to 15 years. I believe all ties used on the railways in England are treated with creosote. I am not an expert on this subject, in fact, I do not know much about it, but it seems to me that from the point of conservation creosoting at any price would be cheap. Of course this matter is brought prominently forward now as a result of the increase in the price of ties. One matter I would like to ask a question about. Can Mr. Wicksteed tell us whether there is any difference in the number of ties used per mile in this country as compared with the practice of railways in other countries. I have been impressed by the enormous number of ties which have been used, and if more ties the being put down than are actually required they are being wasted. But, as we know, the policy in this country has been generally to get the rails laid and the trains running and afterwards to make the betterments found necessary. Our purpose should be to make the roadbed better, the tie better and the steel rail better, because if we have not a good roadbed we cannot operate economically.

Mr. Wicksteed:

I think the question asked was what is the number of ties used per mile. The number is, I believe, 2,700, or about 2 feet between the ties, but we have gone up slightly higher than that, and, I think, the average is now about 3,000 per mile. I understand the English roads use the creosoted ties almost without exception, but, of course, their timber is more expensive than ours and comes mostly from the Baltic ports. They have gone extensively into the treating methods and I think their ties are almost invariably treated in the same way. There is also another process called the "Burnetising" pro-

cess, in which zinc chloride is used. This is cheaper than the creosote but is not so effective.

Mr. Eagle:

I am not conversant with the plant which Mr. McMullen has spoken about, but it seems to me that it would be good policy on the part of the railroads to consider treating their ties at the point where the ties are cut. In British Columbia there is an abundance of fuel and the waste which is the result of forest fires might be utilized in this drying process. But would it not be advisable to erect a small plant at the point where the ties are cut so as to cheapen the initial cost and also reduce the transportation charges?

Mr. McMullen:

Our intention has always been to get as near as possible to the source of supply. With regard to the cost of operation, this would be as expensive in a small as in a large plant. The attendance would cost more per tie but the fuel cost would probably be less. The freight charges would also be less as the weight of the ties would be reduced over 40% by drying.

Mr. Wicksteed:

I might also add that in operating the plant, the branches and tops of trees or other such waste, which are often the cause of bush fires, could be utilized in the plant in drying the ties and thus cheapen the cost of fuel.

Mr. Crumpton: This is an excellent idea and might prove cheaper than the ordinary practice. I would like to ask Mr. McMullen if there is anything in his method which makes it better than the ordinary method of creosoting.

Mr. McMullen:

The suggestion of the portable drying plant is a good one. As to value and cost compared with the ordinary method of creosoting, the main points we make in our favor are:

1. Economy—a saving per tie is effected.
2. Longer life to the ties by our process.
3. Use of timber now discarded becomes readily possible.
4. Simplicity of plant makes the small unit system capable of adoption. This is not practicable with present methods of creosoting.

There is very little to the plant except the boilers and kilns and these can be large or small as desired. Undoubtedly the

kilns could be constructed so that they could be moved occasionally without too much expense. The attendance would cost relatively more in a small plant than in a large one, as it is necessary to have a competent man watching the kilns night and day, and he could watch a large plant as well as a small one. Careful watching is necessary as much variation in temperature and humidity would injure the ties.

Mr. Crumpton:

I would like to ask what the cost of a plant of this kind would be per thousand ties.

Mr. McMullen:

We had an estimate made three years ago by a man who was supposed to be competent in dry kiln work. He thought that a plant which would handle 100,000 ties at a time would cost $100,000. As hemlock, birch, poplar and similar woods can be dried in about 30 days, such a plant would easily handle a million ties a year.

Mr. Eagle:

In British Columbia the little plants could make big profits. The plants could be located at different points in small units and as soon as the timber supply was exhausted at one point they could be moved to another point and start over again. That appears to be the logical solution of the question.

Mr. McMullen:

I do not think a small plant capable of handling 10,000 ties at a time could be built for $10,000, but it could probably be built for $15,000, and the plants could probably be built in such shape that they could be moved as required.

Mr. Hunter:

In regard to the New Brunswick fir, it is of coniferous growth but it is too sort for ties. If by your process it could be made hard enough and also exclude the moisture, it would be a good thing, for then it could be used for tiees, and there are large quantities of it in New Brunswick.

Mr. McMullen:

We have tried balsam ties in the track, and treated them. Their efficiency can be greatly increased.

Mr. Hunter:

We call it fir. The only reason it is not used for ties is that it is too soft.

Mr. McMullen:

I have a report which mentions some of the ties we sent down there. We called it a balsam. They called it fir. It is softer than the spruce. It is very easily dried and is a very good wood when it is dried, being quite strong and durable.

Chairman:

We have listened with a great deal of interest to Mr. Wicksteed's paper. He had to catch a train for Toronto and was obliged to leave the meeting. He evidently gave considerable time and study to the paper, as evidenced by the information it contains. We are also indebted to Mr. McMullen for the valuable information he has given on the treating of ties. It is an eye-opener to many of us to know that it is possible to have a treating plant which can be moved about the country and can treat ties at the source of supply. A motion for a vote of thanks will be in order.

Mr. Crumpton:

I take pleasure in moving a hearty vote of thanks to Mr. Wicksteed for his paper, and to Mr. McMullen for his remarks in connection with it.

Mr. Hannaford:

Seconded.

Chairman:

It has been moved by Mr. Crumpton, seconded by Mr. Hannaford, that a hearty vote of thanks be tendered to Mr. Wicksteed and Mr. McMullen. All in favor please signify in the usual way. Carried. I declare the motion carried. If there is nothing else to come before the meeting we will consider it adjourned. The Secretary has arranged for coffee and sandwiches, and we shall be glad to have the members and visitors stay.

At the next meeting a paper will be read on the subject of "The Storage of Fuel and Spontaneous Combustion," by Mr. D. H. Pudney, Fuel Inspector of the Canadian Pacific Railway at Toronto.